Dec. 19, 1939. D. G. BAKER 2,183,735

THREAD WINDING MACHINE

Filed Jan. 24, 1935 4 Sheets-Sheet 1

Fig. 1.

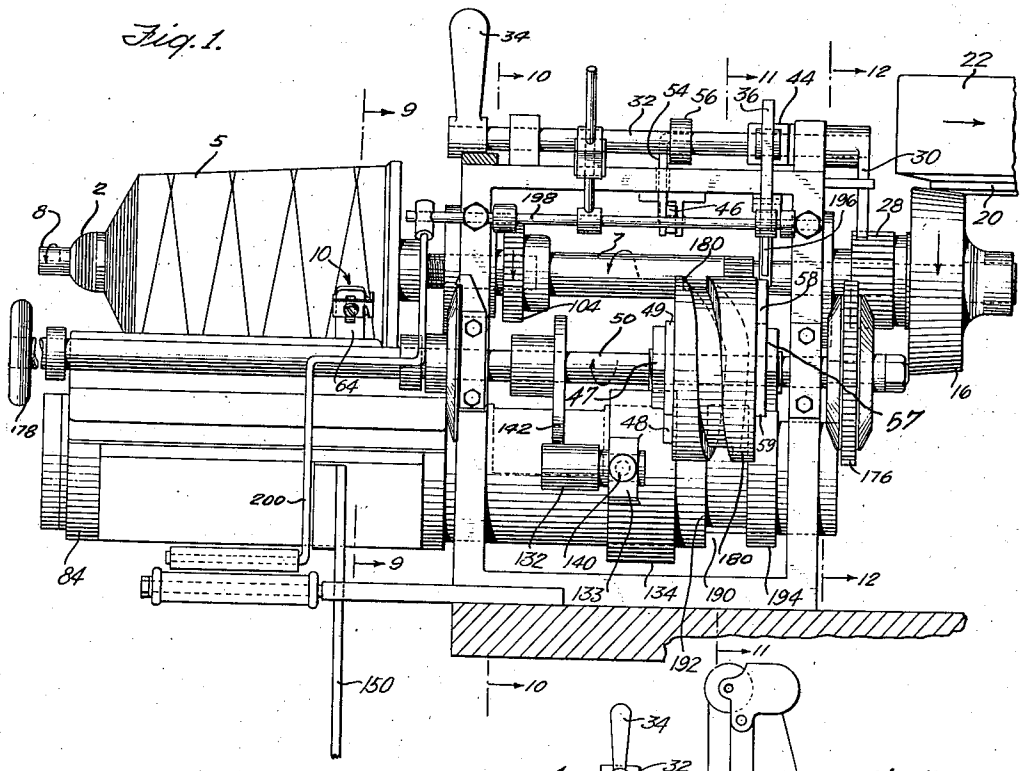


Fig. 2.

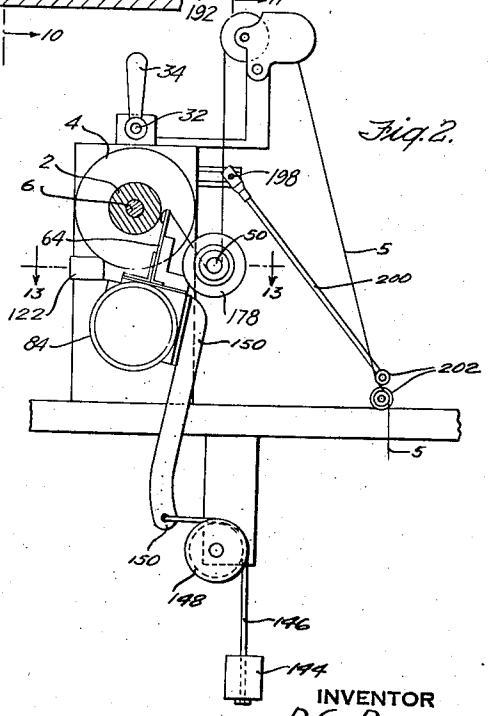
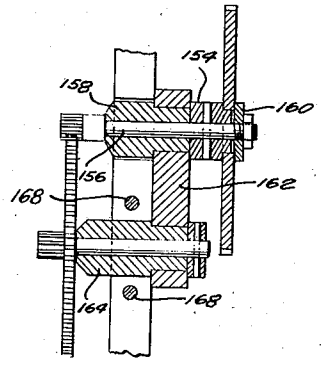


Fig. 3.



INVENTOR
D. G. BAKER.
BY
Bartlett Eyer Scott & Steel,
ATTORNEYS

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THREAD WINDING MACHINE

Filed Jan. 24, 1935 4 Sheets-Sheet 2

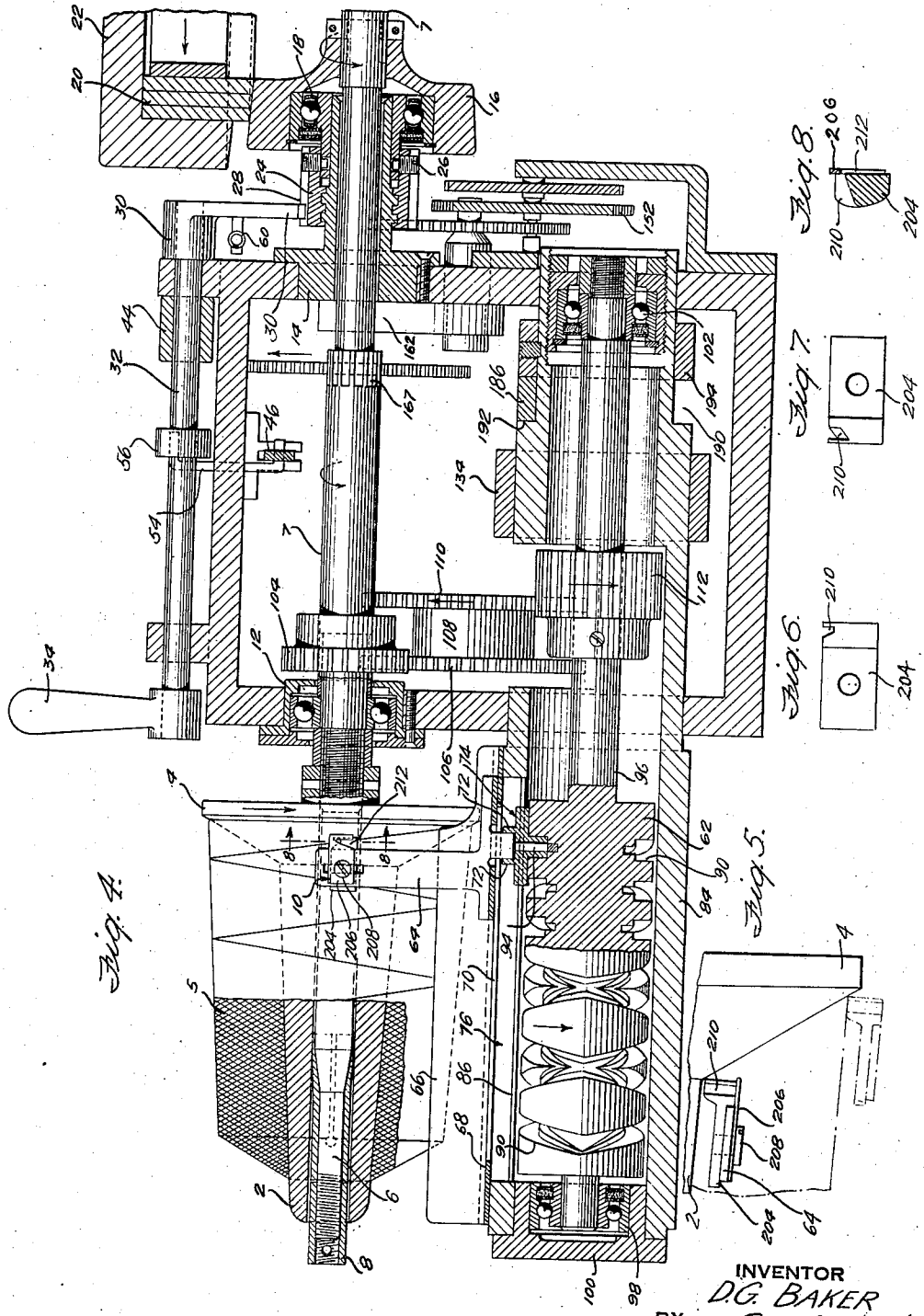

Fig. 4.

Fig. 5.

Fig. 8.

Fig. 7.

Fig. 6.

INVENTOR
D. G. BAKER
BY
Bartlett Eyer Scott & Kiel
ATTORNEYS

Dec. 19, 1939. D. G. BAKER 2,183,735

THREAD WINDING MACHINE

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Fig. 9.

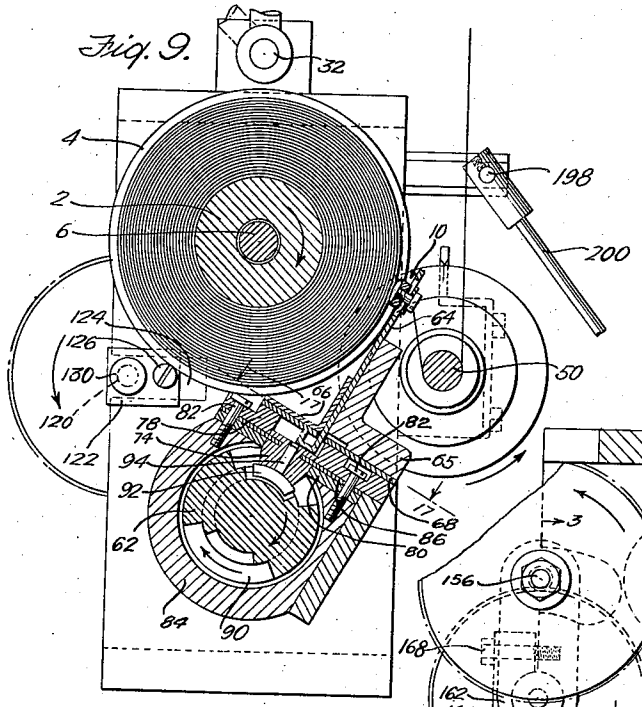


Fig. 11.

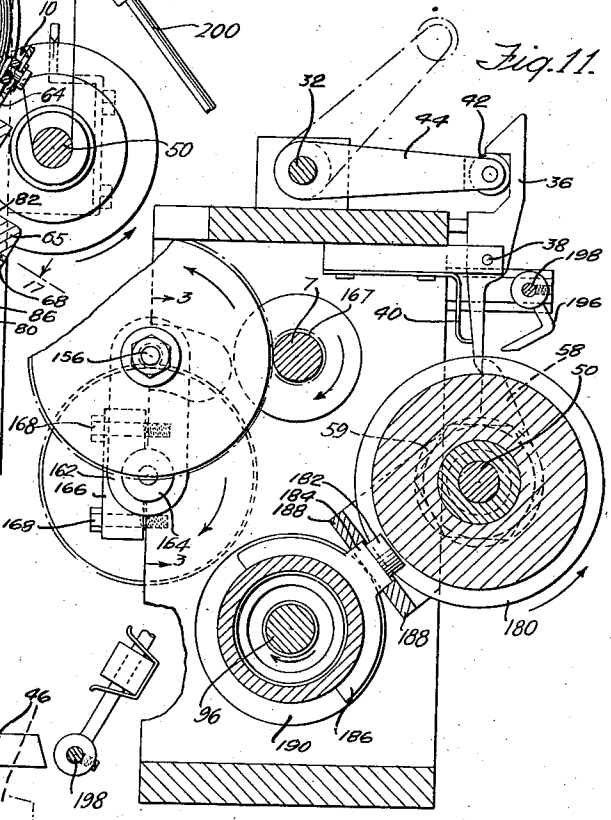
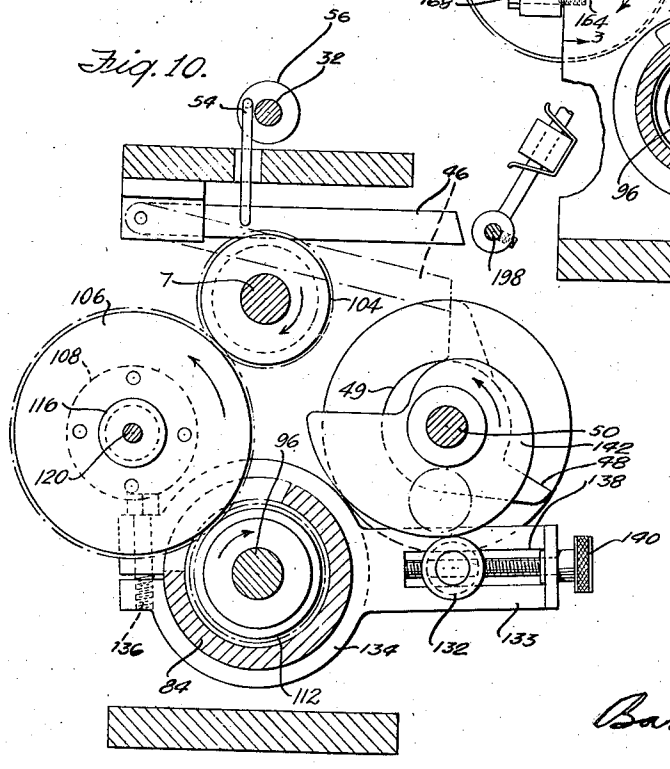


Fig. 10.



INVENTOR
D. G. BAKER
BY
Bartlett Eyre Scott & Peed
ATTORNEYS

Dec. 19, 1939. D. G. BAKER 2,183,735

THREAD WINDING MACHINE

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Fig. 12.

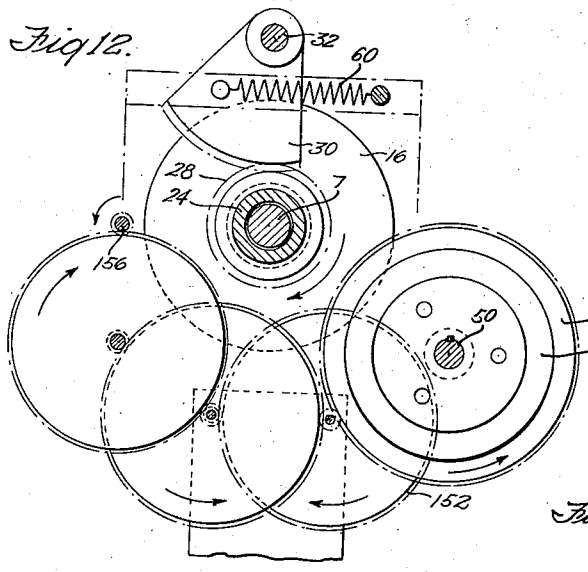


Fig. 14.

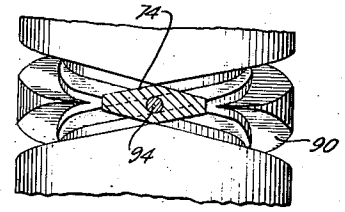


Fig. 15.

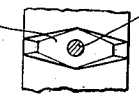


Fig. 16.

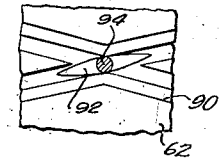


Fig. 13.

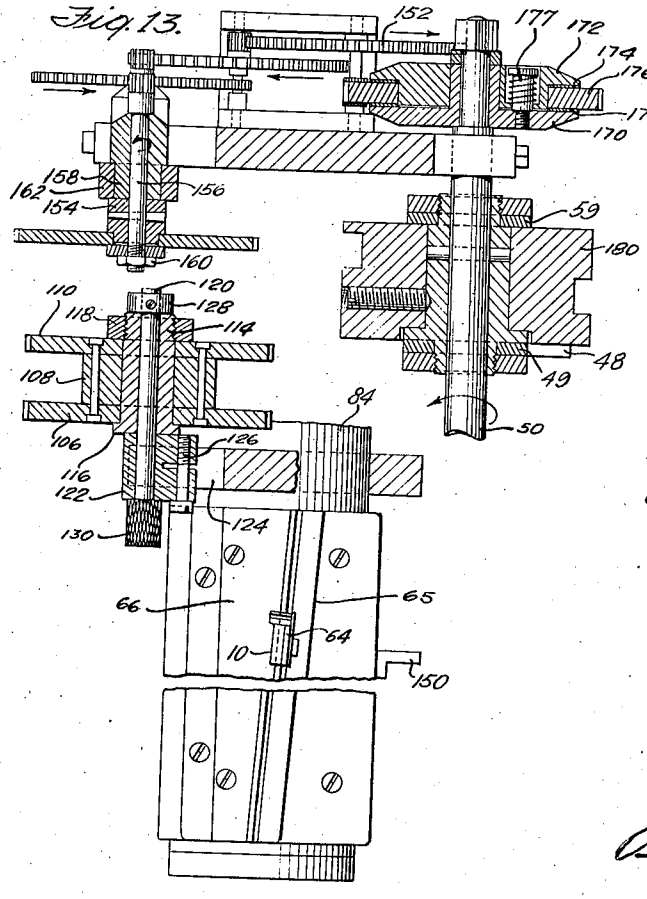
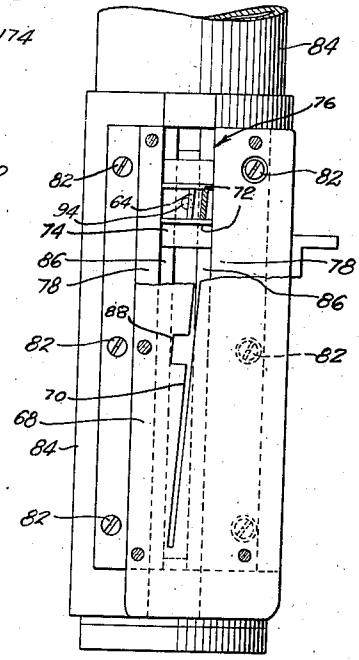


Fig. 17.



INVENTOR
D. G. BAKER
BY
Bartlett Eyer Scott & Reed
ATTORNEYS

Patented Dec. 19, 1939 2,183,735

UNITED STATES PATENT OFFICE

2,183,735

THREAD WINDING MACHINE

Dickerson G. Baker, Holyoke, Mass., assignor to The American Thread Company, Jersey City, N. J., a corporation of New Jersey

Application January 24, 1935, Serial No. 3,335

14 Claims. (Cl. 242—43)

One object of my invention is to provide a novel and improved machine for winding a thread cop.

Another object of my invention is to provide a thread winding machine that is adapted for accurately winding a predetermined length of thread on successive packages and at the same time maintaining the diameter of such packages within close limits irrespective of any permissible variation in the diameter or size of the thread being wound.

Another object is to provide a novel and improved machine that is particularly adapted for winding a thread cop of the type having one end of the thread mass convex and the other end concave.

A further object of my invention is to provide a machine for winding thread cops with a Universal wind which is simple in construction and capable of running at a higher rate of speed than machines of this character heretofore produced.

A still further object of the invention is to provide novel and improved mechanism which is particularly adapted for traversing the thread guide of a thread winding machine.

The several features of the invention, whereby the above-mentioned and other objects may be attained, will be readily understood from the following description and accompanying drawings, in which:

Figure 1 is a side view partly in section of a thread winding machine embodying features of my invention in their preferred form, gears 106 and 110 and portion 108 hereinafter described being omitted for the sake of clarity;

Fig. 2 is a front elevation, on a reduced scale, of the machine, the cop tube and spindle being in section;

Fig. 3 is a detail sectional view taken on the line 3—3 of Fig. 11;

Fig. 4 is a longitudinal sectional elevation of the machine;

Fig. 5 is a detail plan view of a thread guide and a portion of the cop tube illustrated in Fig. 4, the thread guide being shown in one of its outer positions by broken lines, and the outer surface of the mass of thread is also shown by broken lines;

Figs. 6 and 7 are detail elevations of component parts of the thread guide;

Fig. 8 is a detail sectional view of the thread guide taken substantially on the line 8—8 of Fig. 4;

Figs. 9, 10, 11 and 12 are sectional views respectively taken on the lines 9—9, 10—10, 11—11 and 12—12 of Fig. 1;

Fig. 13 is a sectional view on an enlarged scale taken substantially on the line 13—13 of Fig. 2;

Fig. 14 is a detail plan view of a portion of a thread guide actuating cam with the cam follower shown in section;

Fig. 15 is a bottom plan view of a portion of the cam follower;

Fig. 16 is a detail plan view of a portion of the cam and lower portion of the follower; and

Fig. 17 is a sectional plan view taken on the line 17—17 of Fig. 9.

The machine illustrated in the drawings is particularly adapted for use in winding a thread cop of the type of the one described and claimed in the patent to Louis L. Moore No. 1,964,385, dated June 26, 1934. This cop comprises a conical core 2 and a base 4 having its upper or inner surface convex (Figs. 1 and 4). The thread 5 is cross wound, preferably a Universal wind being employed, on the core in such a manner that the successive layers are progressively displaced longitudinally of the tube so as to cause the inner or lower ends of the layers to be laid against the convex surface of the base 4, the outer ends of the layers being convexedly arranged.

As shown, the machine is provided with a winding spindle 6 and any suitable means such as the sleeve 8 for detachably securing a cop tube on the spindle, and a thread guide 10 for traversing the thread longitudinally of the cop tube. The spindle 6 is carried on the forward end of a shaft 7 that extends through a ball-bearing 12 in the front of the machine frame, and its rear portion extends through a bushing sleeve 14 mounted in an aperture in the rear wall of the frame. A pulley or wheel 16 is secured on the projecting rear end of the spindle shaft 7 and is mounted to turn on a ball-bearing 18 between its inner periphery and the outer end portion of the bushing sleeve 14. The outer periphery of the wheel 16 is provided with a conical, friction surface which is adapted to be positioned in driving engagement with friction members 20 on a horizontal friction wheel 22. The wheel 22, only a portion of which is shown in the drawings, may be used to simultaneously drive a plurality of winding heads.

The friction wheel 16 is held from rotary movement on the spindle shaft 7 but is permitted to be moved longitudinally thereof into and out of engagement with the driving friction wheel 22. In the illustrated construction the wheel 16 is thrown out of operative engagement

with the driving friction wheel 22 at the completion of a predetermined number of revolutions of the spindle 6 so as to stop the winding operation. The wheel 16 is thus shifted by means of a collar 24 that is screw-threaded on the bushing sleeve 14 and is connected with the friction wheel by means of screws 26 which are received in slots in the inner member of the ball-bearing 18, the screw threads on the bushing sleeve 14 being left-handed. By turning the collar 24 in opposite directions it is shifted longitudinally by means of its screw-threaded connection with the bushing sleeve 14 to move the friction wheel 16 into and out of operative engagement with the driving wheel 22. To thus shift the collar 24 it is provided with gear teeth 28 that are engaged by a gear segment 30 secured on one end of a rock shaft 32. This rock shaft is adapted to be turned by means of a hand lever 34, secured thereon, in one direction to act through the segment 30 and collar 28 to shift the friction wheel 16 into operative engagement with the driving pulley 22.. The friction wheel 16 is held in engagement with the driving wheel 22 by means of a latch lever 36 (Fig. 11) pivoted at 38 on a bracket projecting from the machine frame, said lever being pressed in one direction by means of a leaf spring 40. This latch lever 36 engages a roll 42 on the free end of an arm 44 secured to the rock shaft 32, the roll being brought into holding engagement with the latch upon turning of the rock shaft 32 by means of the hand lever 34. Also, said movement of the rock shaft 32 moves the free end of a pivoted dogging arm 46 out of the path of a lug 48 formed on a disk 49 secured on a shaft 50, the dogging arm 46 being connected with the rock shaft 32 through a link 54 and a collar 56 secured to the shaft. At the completion of a predetermined number of revolutions of the spindle, a lug 58 formed on a disk 59 also secured on the shaft 50 strikes the lower end of the latch lever 36 and throws the lever out of holding engagement with the roll 42, whereupon a coiled spring 60 connected with the gear segment 30 serves to turn the shaft 32 in a direction to shift the friction wheel 16 out of operative engagement with the driving wheel 22.

During such operation of the machine from the time that it is thrown into operation by means of the hand lever 34 until it is automatically thrown out of operation by means of the lug 58 a complete cop is wound. The wound cop may then be removed from the spindle and an empty cop tube substituted.

The thread guide 10 is traversed longitudinally of the thread cop through connection with a traversing cam 62. The thread guide is mounted on the upper end of an arm 64 which may be of sheet metal which is mounted to slide longitudinally of the thread cop in a guideway formed by angular guide members 66 and 65 secured on a plate 68. The lower end of this guide arm 64 extends through a slot 70 in the plate 68 and its lower end is bent into rectangular form as shown in Fig. 9, and is arranged to engage between transverse upstanding ribs 72 on the upper side of a cam follower 74 (Fig. 17). This follower 74 is mounted to slide in a guiding slot 76 which is formed by two upper guide plates 78 and two lower guide plates 80, the slotted guide plate 68 being secured to the tops of the guide plates 78. The plates 78 and 80 are secured by screws 82 to a casing 84 that surrounds the thread guide cam 62. Between the upper and lower plates 78 and 80 are secured plates 86, the inner longitudinal margins of which project a distance into the slot 76 and are received in longitudinal grooves in the upper portion of the cam follower 74.

The guideway, including the slot 70 for the thread guide, is arranged parallel to the conical surface of the cop tube so that the guide is traversed parallel with the tube. The follower slot 76, however, is arranged parallel with the axes of the spindle 6 and the cam 62. The guide ribs 72 projecting from the top side of the cam follower allow for the necessary movement of the thread guide supporting arm with relation to the cam follower.

In order to enable the thread guide arm to be easily connected with the follower, one wall of the slot 70 is provided with a notch 88 through which the lower end of the thread guide arm may be easily inserted and removed.

The thread guide cam 62 is provided with right and left hand crossing spiral grooves 90, the upper portions of the grooves being relatively wide so as to receive the lower portions or shoe of the cam follower 74. The shoe has surfaces which in effect form segments of a nut accurately fitting the outer groove in the traverse cam, Figs. 14 and 15. The inner portion of the groove in the traverse cam is relatively narrow to receive a supplemental shoe or pilot 92 that is formed on the lower end of a pin 94 pivoted in an aperture in the cam follower.

The relatively wide cam shoe 74 serves to do the work in traversing the thread guide, and the pivoted shoe 92 serves as a pilot to insure the upper shoe or follower properly crossing the frogs in the cam groove. By making the cam follower of the form shown and described, it is enabled to instantly change direction of travel at the end of the traverse throw which would not be possible with a shoe having the usual rounded sides in which latter case a slight dwell would be necessary. Thus it will be apparent that with the use of my improved double cam groove and follower smooth and continuous motion of the follower is insured.

The traverse cam 62 is formed on a shaft 96 which has its forward end mounted in a ball-bearing 98 in a cap 100 on the forward end of the cam casing 84, and its rear end mounted in a ball-bearing 102 in the rear end of the cam casing 84, the cam casing being mounted in apertures in the front and rear sides of the machine frame. The cam shaft 96 is driven from the spindle shaft 7 through a gear 104 secured on the spindle shaft which engages a gear 106 that is secured on one side of a hub 108. To the other side of this hub is secured a gear 110 which drives a gear 112 secured to the cam shaft 96. The two gears 106 and 110 and the hub 108 are mounted to turn on a bushing 114 (Fig. 13), and are held from axial movement thereon between a flange 116 on one end of the bushing and a nut 118 screw-threaded on the other end of the bushing. This bushing is secured on a pin or stud 120 that is secured in a block 122 mounted in a slot 124 in the machine frame, Fig. 9. This block 122 is split and has flanges which engage against opposite sides of the slotted frame member, the flanges being held tight against the frame member by a screw 126 when it is tightened, the tightening being possible due to the resiliency of the block due to the split. The stud 120 and bushing 114 are secured to the block 122 by means of a collar 128 secured on one of its ends and a knurled knob 130 on its

other end. The gears 106 and 110 are of such relative size as to cause the traverse cam 62 to rotate at a slightly less speed than the spindle and thus provide for the necessary gain in the winding. To vary this gain, the gears 106 and 110 may be removed and other gears substituted, the gears being removable by removing the supporting block 122 from its slot and substituting another block having the proper gears thereon.

In winding machines heretofore in general commercial use, the thread guide is moved outwardly during the winding operation by bearing on the thread mass as it is built up. In my improved machine, however, means is provided for positively moving the thread guide outwardly during the winding operation. To provide for this, the cam casing 84 is mounted to turn in the front and rear sides of the frame and during the winding operation it is slowly turned in a direction to impart the desired outward movement of the thread guide. The mechanism for thus turning the casing 84 comprises a cam roll 132 that is carried on an arm 133 projecting from a split sleeve 134 which surrounds the casing and is secured thereto by means of a bolt 136 (Fig. 10). This cam roll 132 is mounted on a block that is mounted to slide in a guide slot 138 in the arm 133, which block is adapted to be moved to adjust the position of the cam roll 132 with respect to the cam 142 by means of a screw 140. The cam roll 132 is adapted to be acted upon by a cam 142 carried by a shaft 50 hereinbefore referred to. The cam roll is yieldingly held in engagement with the surface of the cam 142 by means of a weight 144 (Fig. 2) which is connected by a cord 146, that passes over a sheave 148, with a depending arm 150 on the casing. The shaft 50 is driven, consequently the cam 142, so as to make somewhat less than one revolution during the operation of completely winding a thread cop.

The shaft 50 that carries the cam 142 is journaled in bearings in the front and rear sides of the machine frame and is driven through speed reducing gearing 152 from the spindle shaft 7. The speed reduction is such that the shaft 50 makes somewhat less than one revolution during the complete winding of a thread package. This speed ratio may be varied to meet different conditions by changing one of the speed reducing gears. To provide for this, one of the gears is mounted on a collar 154 that is secured on a shaft 156 journaled in a bearing block 158 (Fig. 13). The gear is secured on the collar 154 by means of a nut and washer 160 on the shaft 156, which nut binds the gear against a shoulder on the collar. The bearing block 158 is mounted in an aperture in the upper end of a supporting arm 162 (Fig. 11) which has its lower end secured on a bearing block 164 in which is journaled the shaft of another one of the reducing gears. This bearing block 164 is detachably held in fixed position on the machine by means of a clamping member 166 which is secured by screws 168. This construction enables the gear on the shaft 156 to be easily removed, and when a new gear is substituted, it may be positioned into operative engagement with the driving pinion 167 on the spindle shaft 7.

The shaft 50 is connected with the speed reducing gear 152 through a friction slip clutch comprising a member 170 secured on the shaft 50 and a member 172 rotatably mounted on a hub of the member 170. The two members have friction surfaces 174 which engage opposite sides of a gear comprising a ring 176 that constitutes one of the gears of the chain 152. The forward end of the shaft 50 is provided with a hand-wheel 178. The two clutch members are yieldingly pressed toward each other by a spring 177.

With this construction, upon the completion of the winding of a thread cop and stoppage of the machine by engagement of the dog 58 with the latching lever 36, as above described, the operator may turn the shaft 50 independently of the spindle and thus cause the cam 142 to move the thread guide outwardly from the thread package so as to permit the completed package to be removed from the spindle and replaced by the next thread tube or cop to be wound. The operator then still further turns the shaft 50 so as to cause the tip of the cam 142 to pass the cam roll, allowing the casing to be turned by means of the weight 144 to swing the thread guide into its initial position in close proximity to the core of the thread tube. Such turning movement of the shaft 50 by the operator is limited by the engagement of the dog 48 on the shaft 50 with the end of the latch 46. The machine is then ready to be again thrown into operation by means of the starting handle 34 which moves the driving friction wheel 16 into engagement with the wheel 22, this driving engagement being maintained by the engagement of the latch lever 36 with the roll 42. Also, this movement of the handle 34 raises the latch lever 46 out of engagement with the dog 48, allowing the shaft 50 to be driven through its connection with the spindle shaft.

It may be noted that by angular adjustment of the dog 58 on the shaft 50 that the stoppage of the machine may be varied as desired, and that by angular adjustment of the dog 48 on the shaft 50 the initial position of the thread guide may be varied as desired. The dogs 48 and 58 are respectively held in adjusted positions by lock nuts 47 and 57 threaded on the shaft 50 and clamping the dogs against the ends of a cam 180 hereinafter described. In the illustrated machine, means is provided for shifting the path of traverse of the thread guide with relation to the thread package so as to cause the successive layers of thread to be progressively displaced longitudinally of the cop tube so as to form the package illustrated in Figs. 1 and 4 of the drawings. To provide for this, the casing 84 is mounted to slide longitudinally and is shifted longitudinally during the winding operation to vary the path of movement of the thread guide with relation to the package, by means of a cam 180 secured on the shaft 50. This cam is provided with a peripheral cam groove which receives a stud or roll 182 that is mounted on a boss 184 on a fork 186. The boss 184 is mounted to slide in a guide slot in a fixed bracket 188 and the fork 186 is received in a groove 190 formed by a shoulder 192 on the casing 84, and a collar 194 secured on the casing. The groove of the cam 180 is such that the casing is shifted longitudinally during the winding operation to cause the path of the thread guide 10 to be varied to effect the desired progressive displacement of the layers of winding.

After the stoppage of the machine at the completion of the winding, the turning of the shaft 50 by the operator causes the cam 180 to restore the casing 84 and thread guide to their initial positions ready for the next winding operation of the machine.

In the illustrated construction, means is provided for stopping the machine upon breaking of the thread. This means comprises an arm 196 which is secured to a pin or rock-shaft 198 that is adapted to be turned in one direction upon

breakage of the thread, by means of a rod 200 secured to the shaft 198. Upon such turning movement of the rock-shaft 198, the arm 196 strikes the lower end of the latch lever 36 and thus effects immediate stoppage of the machine. The arm 200 is operatively engaged by the thread through suitable means, as for example, the thread guide rollers 202.

It will be apparent that any suitable thread tensioning means (not shown) may be employed in the machine.

In winding a cop provided with a conical base such as the one illustrated in the drawings, it is important that the thread guide lay the thread close against the surface of the base. The thread guide illustrated in the drawings comprises plates 204 and 206 on opposite sides of the thread guide arm 64. These plates are held in position on the arm by means of a screw 208 which extends through an elongated slot in the arm and is screw-threaded into the back plate 204. This back plate is provided with an upwardly opening transverse slot 210 and the plate 206 is provided with a downwardly opening transverse slot 212, the apexes of the two slots being spaced apart to provide a thread guide opening. The thread guide may be readily adjusted on the post by loosening the screw 208. It will be noted in Fig. 5 that this construction of thread guide allows the thread to be positively carried close against the convex surface of the base of the cop tube.

With the machines heretofore commonly used for winding thread packages with the Universal wind considerable difficulty has been experienced in producing packages economically and of the desired uniformity. These packages must contain a definite yardage of thread, and it frequently happens the thread varies considerably in size. The thread is supplied to the machine from a quill or spool which results in substantial variation of tension between the delivery from a full supply quill or spool and a nearly empty one. Said prior machines are usually equipped with measuring devices that control the stop motion of the machine. These devices have a wheel around which the thread is carried in a path to the winding machine so that a predetermined number of revolutions of this measuring wheel acting through a reducing gearing causes the winding machine to stop when the desired yardage has been wound.

With these prior machines, owing to the variation in thread size and the marked variation in tension on the thread, it has been found difficult to wind the package of a given standard with respect to diameter. Moreover, in some types of packages it is desirable to have the cop soft wound as any undue tightness of wind is likely to injuriously affect the elasticity in the thread, especially certain kinds of thread that are soft or unfinished. In prior machines, however, it has been found that any attempts to speed up the winding operation has tended to further increase the tightness of the wind because of the increase in the minimum possible tension at higher thread speeds.

With my improved machine as illustrated in the drawings, the finished thread mass, irrespective of variation in the size of the thread may be wound as closely as possible to the maximum diameter desired and extreme accuracy is attained in the measuring of the thread.

In the present machine the outward movement of the thread guide, instead of being effected by the increasing diameter of the thread mass, is positively moved outwardly by means of the cam 142 which makes something less than one revolution during the winding of the package. This radial outward movement of the thread guide is so proportioned as to be exactly equivalent to the movement which would be caused by the increasing diameter of the thread mass being wound with a thread of unvarying size and wound under the desired diminishing tension and diminishing guide pressure. Thus for any given number of revolutions of the winding spindle the radial distance from the face of the thread guide to the axis of the winding spindle would always be the same and, consequently, the length of the helix of thread laid on the periphery of the thread mass during any complete traverse cycle of the thread guide would increase in fixed proportion to the number of winding spindle revolutions.

With this arrangement, by stopping the winding spindle after the proper number of revolutions of the spindle, the required yardage is wound and the thread mass is of more nearly standard dimensions. If the thread being wound should happen to be smaller than the size for which the machine was adjusted, the resulting finished package would be softer or less dense than standard especially in the case of soft finished threads. If the thread being wound should happen to be large, the resulting finished thread mass would be hard and dense.

Still another important advantage results from said combination of positive guide retraction with the thread measuring function. Heretofore, universally wound packages of certain kinds of thread such as "unboiled grey" tend to bulge at the ends when the diameter of core is much less than the finished diameter. This bulging is very unsightly and definitely harmful in certain kinds of winding. Machines heretofore commonly used for producing the so-called Universal package, attempt to minimize this bulging of the ends by various devices for automatically reducing the tension on the thread and also the pressure of the guide face against the periphery as the thread mass increases in size while winding.

I have found that this desired result can be satisfactorily accomplished in my improved machine, by providing the guide retracting cam 142 with a spiral working surface properly developed for each successive unit of angular movement, thus retaining the automatic tension reducing feature.

My improved traverse cam 62 has an inner pilot groove in which the usual dog is carried and an outer groove in which a shoe is accurately fitted so that there is no lost motion where the right and left-hand helices join at each end of the traverse cam. The shoe is in reality a right and left-hand nut having practically no looseness at any points of its travel except at the "frogs" or intersections of the right and left-hand helices on the cam, the dog in the lower groove carrying the shoe in the proper direction as they cross said "frogs".

Packages of the type of the one described have been found to be most satisfactory when the guide spindle makes slightly less than eight revolutions to one complete cycle of the thread guide. To effect this with the usual single revolution guide traverse cam would require a large diameter gear on the cam shaft or a cumbersome compounding of the gears transmitting motion from the winding spindle to the traverse cam shaft. My improved multi-revolution traverse cam per-

mits a more compact design of the machine, a much less weight in the reciprocating parts of the guide motion and, consequently, a much higher winding speed without objectionable wear, and it also facilitates lubrication.

While the features described above are well adapted for use in the type of machine illustrated in the drawings, and in a machine for winding the type of package illustrated, it is to be understood that, except as defined in the claims, certain features of the invention are not limited to use in a machine embodying any or all of the other features.

What I claim is:

1. In a winding machine, the combination of a spindle, means including a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, and means operable independently of the accumulation of thread on the spindle for retracting the thread guide from the spindle during the winding operation while maintaining the thread guide substantially in contact with the wound thread mass.

2. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, and means for retracting the thread guide from the spindle during the winding operation comprising a cam and means for driving the cam in a definite timed relation to the spindle.

3. In a winding machine, the combination of a spindle adapted to receive a cop tube thereon, means including a thread guide for traversing the thread longitudinally of the cop tube so as to cause the thread to be cross wound on the tube, means operable independently of the accumulation of thread on the cop tube for moving the thread guide outwardly during the winding operation so as to maintain the guide substantially in contact with the outer surface of the thread mass, and means for still further moving the guide outwardly after the completion of the winding operation to permit removal of the wound cop and substitution of another cop tube and for returning the guide to its initial position in proximity to the core of the substituted cop tube.

4. In a winding machine, the combination of a spindle adapted to receive a cop tube thereon, a thread guide for traversing the thread longitudinally of the cop tube so as to cause the thread to be cross wound on the tube, a cam, means for rotating the cam during the winding operation in timed relation to the rotation of the spindle to move the thread guide outwardly in proximity to the mass of thread being wound, and means capable of being manually operated after completion of the winding operation to still further move the thread guide outwardly to permit removal of the wound thread cop and the substitution of another, and to restore the cam to its initial predetermined angular position.

5. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a cam, connections between the cam and thread guide for thus traversing the guide during the rotation of the cam, a casing enclosing the cam having provision for guiding the thread guide during its traversing movement, and means operable independently of the accumulation of thread on the spindle for turning the casing to move the thread guide in a direction away from the spindle during the winding operation while maintaining the thread guide substantially in contact with the thread mass.

6. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a cam, connections between the cam and thread guide for thus traversing the guide during the rotation of the cam, a casing enclosing the cam having provision for guiding the thread guide during its traversing movement, and means for turning the casing to move the thread guide in a direction away from the spindle during the winding operation, comprising a cam and connection between the cam and spindle for driving the cam in a definite timed relation to the spindle.

7. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a cam, connections between the cam and thread guide for traversing the guide longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a casing surrounding the cam, connections between the casing and thread guide for guiding the thread guide during said traversing movements thereof, a shaft, a cam carried by the shaft, connections between said cam shaft and the spindle for driving the shaft in a definite timed relation to the spindle, said connections having provision of means for permitting the cam shaft to be turned by the operator independently of the spindle, and connections between said second mentioned cam and said casing for turning the casing to move the thread guide outwardly with relation to the spindle during the winding operation.

8. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, means for thus traversing the thread guide during the winding operation, a shaft, a cam carried by the shaft, connections between the cam shaft and said spindle for rotating the cam in a definite timed relation to the spindle, said connections having provision of means to permit said cam shaft to be rotated by the operator with relation to the spindle, and means actuated by said cam for moving the thread guide outwardly during the winding operation.

9. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a cam, a casing surrounding the cam, means on the casing for guiding the thread guide during said traversing movements, connections between the thread guide and said cam for effecting such traversing movements of the thread guide, and means for turning the casing to move the thread guide in a direction away from the spindle during the winding operation comprising a cam, and means for driving the cam in a definite timed relation to the spindle.

10. In a winding machine, the combination of a spindle, means including a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, means for yieldingly pressing the thread guide toward the spindle, and means operable independently of the accumulation of thread on the spindle for moving the thread guide outwardly during the winding operation against the

action of said yielding means while maintaining the thread guide substantially in contact with the thread mass.

11. In a winding machine, the combination of a spindle, means including a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, means for driving the spindle, means acting automatically at the end of a predetermined number of revolutions of the spindle for disconnecting the spindle from its driving means and means operable independently of the accumulation of thread on the spindle for retracting the thread guide from the spindle during the winding operation while maintaining the thread guide substantially in contact with the thread mass.

12. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a cam, connections between the cam and thread guide for thus traversing the guide during the rotation of the cam, a casing enclosing the cam having means for guiding the thread guide during its traversing movement, means for shifting the casing to shift the path of movement of the thread guide to progressively displace the layers of winding in a direction longitudinally of the spindle, and means operable independently of the accumulation of thread about the spindle for turning said casing to retract the thread guide from the spindle during the winding operation while maintaining the thread guide substantially in contact with the thread.

13. In a winding machine, the combination of a spindle, a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound on the spindle, a shaft, means for driving the shaft in timed relation to the spindle during the winding operation, said shaft being adapted to be turned by the operator with relation to the spindle, a cam carried by the shaft, means actuated by said cam for moving the thread guide outwardly during the winding operation, a second cam carried by said shaft, means actuated by the latter cam for shifting the path of the traversing movement of the thread guide in one direction to progressively displace the layers of winding in a direction longitudinally of the spindle during the winding operation.

14. In a winding machine, the combination of a spindle, means including a thread guide for traversing the thread longitudinally of the spindle so as to cause the thread to be cross wound thereon, and means for retracting the thread guide from the spindle in definite timed relation to the speed of rotation of the spindle.

DICKERSON G. BAKER.